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MARSHALL ISLANDS: A STUDY OF DIET AND LIVING PATTERNS

J.R. NAIDU, N.A. GREENHOUSE, G. KNIGHT, AND E.C. CRAIGHEAD

MASTER

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J.R. NAIDU, N.A. GREENHOUSE, G. KNIGHT,* AND E.C. CRAIGHEAD**

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Marshall Islands: A Study of Diet and Living Patterns

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This report was typed by members of the Word Processing group. Their painstaking effort is commended and recognized.

Marshall Islands: A Study of Diet and Living Patterns

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Abstract

This study summarizes information on diet and living patterns for the Marshallese. The data was derived from literature, answers to questionnaires, personal observations while living with the Marshallese for periods extending from months to years, and from direct participation in their activities. The results reflect the complex interactions of many influences, such as, the gathering of local foods, the receipt of food aid through programs, such as, school-lunch, typhoon-relief, food distributed to populations displaced as a result of nuclear testing, and in recent times the availability of cash for the purchase of imported foods. The results identify these influences and are therefore restricted to local food diets while recognizing that the living patterns are changing as local food gathering is replaced by other food supplies. The data will therefore provide the necessary information for input into models that will assess the radiological impacts attributable to the inhabitation of the Marshall Islands. It is recommended that this study should be continued for at least two to three years in order to more accurately identify trends in local food consumption and living patterns.

Objective

The goal of this study is the evaluation of dietary and living patterns among the inhabitants of the Northern Marshall Islands. These data will be used as input to the dose estimation models (external and internal) that are being developed for the Marshallese who continue to inhabit or will inhabit areas previously contaminated by radioactive fallout from U.S. Pacific Nuclear tests.

Introduction

This study, by the Safety and Environmental Protection Division (S&EP) of the Brookhaven National Laboratory, is a continuation of work which began in 1974 as part of environmental monitoring programs for Bikini, Rongelap and Utirik. The Northern Marshall Islands Radiological Survey (NMIRS) of 1978 provided an opportunity to carry out a study in extensive detail, since the role of S&EP was devoted exclusively to diet and living patterns. Since then, two of the authors, (G. Knight and J.R. Naidu), have continued the study in order to increase the data base obtained through this work. As pointed out in a prelimi-

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nary report to the NMIRS group, one of the key requirements for reliable data gathering is the isolation of the islanders from the "outside" influence of field trip ships and from scientists conducting environmental or medical studies. This stems from the fact that the Marshallese tend to give such inquiries answers which they think are being sought, rather than to provide the objective information desired. Thus the NMIRS program, wherein three of the authors spent short periods of time in residence at each island, served to provide a basis for comparisons with past observations, and to establish a foundation for subsequent studies following the NMIRS. These studies have now been extended through 1979 and are expected to continue indefinitely.

Methods

A thorough review of all existing literature was performed (1-6). Earlier studies (1,2) had as their goals the quantitative and qualitative assessments of food intake, and the establishment of its nutrient value. However, it became apparent during the current study that the earlier studies suffered from certain unintended biases which were the result of inquiries made during short field trip visits. We have ascertained that these biases can be minimized by utilizing an observer who has become integrated into the local community to the extent that his or her presence has a negligible impact on community life. The authors of this report have spent periods extending from months to years on the various islands in the Marshalls, during which time they have become an integral part of the island communities, partaking of the local food and participating in (as well as observing) community living patterns. On the basis of this experience, the authors developed a questionnaire which was used to generate much of the dietary information presented in this report.

The generalized information presented in the main body of this report represents a synthesis of the direct observations of the authors, and of the survey data from the questionnaire. Most of the detailed information, which forms the basis for these generalizations, pertains to the following: Islands/Atolls studied, specific aspects of island living patterns, seasonal phenomena, types of fish and methods of fishing, edible birds, individual family food consumption patterns, (imported) food subsidy programs, community cooperative store stocks, and statistics on the edible fractions of local foods. All of the above information is included in the Appendices.

The following dietary interview was prepared in an attempt to determine the local diet by posing questions to the islanders themselves. It was taken to a number of communities at Rongelap in Rongelap Atoll, Utirik in Utirik Atoll, Mejit, Ailuk, Wotho, Jabor in Jaliut Atoll, at Killi Island and Majuro.

The questionnaire of the dietary interviews, which is in Marshallese but presented here as a literal English translation, was as follows:

Marshall Islands Dietary Interview

In answering these questions, please answer in respect to those of your family who presently live at your house and in respect to only those who eat with you every day.

How many people of school age or over are in your family and eat with your family every day?

What is the name of the island where you presently live.

- 1) How many mature coconuts do you use to prepare coconut milk to mix into your family's food in a typical week?
- 2) How many mature coconuts do you grate to mix into your family's food in a typical week?
- 3) If you are an adult and 18 years or over, other than the mature coconuts mixed into your family's food, how many other coconuts do you eat in a typical week?
- 4) With respect to your children or brothers and sisters of ages 10 through 18, other than the mature coconuts mixed in the family's food, how many would you expect one of them to eat in a typical week?
- 5) If you are an adult, how many drinking coconuts do you consume in a typical week?
- 6) And if you are an adult, how many of these coconuts that you drink will you also eat the soft meat thereof?
- 7) With respect to your children or younger siblings of ages 10 through 18, how many unripe coconuts would you expect one of them to drink in a typical week?
- 8) And in respect to these children, how many of these unripe coconuts that one of them would drink would you expect him to also eat the meat thereof?
- 9) If you are an adult, how many of the kenawe coconuts (in a similar fashion as pandanus, the entire husk is sucked and chewed and a considerable portion is eaten) do you eat during a typical month?
- 10) In respect to your children or younger siblings from ages 10 to 18, how many of the kenawe coconuts would you expect one child to eat during a typical month?
- 11) How many of the sprouted coconuts do you cook the iu (haustorium) thereof in preparing traditional dishes to be served at family meals in a typical week?
- 12) Other than the iu prepared for the family meals, how many iu do you eat in a typical week?

13) In respect to the children, how many iu does one child eat in a typical week?

14) If you are a man who makes jebaru (tapped nectar of the coconut flower), how many half-gallon bottles does your family use to drink or mix with the family food each day?

15) How many pandanus do you cook and make into pulp to mix with the family food or to preserve into Jankwon in a typical week during pandanus season?

16) Other than the pandanus you mash into pulp, how many will you eat yourself?

17) In respect to the children, on a typical day how many pandanus does one child eat?

18) During breadfruit season, how many of the bukrol or batakatak varieties do you prepare for your family in a typical week?

19) How many of the bukrol or batakatak varieties do you use to preserve into bwido to be eaten by your family during a typical year?

20) During the season for the mejwan variety of breadfruit, how many do you prepare for your family in a typical week?

21) Other than the mejwan you cook for the family, how many of the ripe fruits do you eat in a typical week when this variety of breadfruit is in season?

22) In respect to the children, how many of the ripe fruits do you think one child eats in a typical week?

23) How many of the mejwan variety of breadfruit do you preserve into jankwon for your family to eat during a typical year?

24) Other than the mejwan breadfruit itself, how many nuts of this variety do you eat in a typical week when it is in season?

25) In respect to the children, how many nuts of the mejwan do they eat in a typical week when it is in season?

26) How many blocks of arrowroot starch (about 10 lbs) do you dig and prepare for your family to eat during a typical year?

27) How many (pounds of) fish do you cook during a typical week for your family to eat? (A good sized rijin species weighs about 2 lbs.)

28) How many pumpkins do you cook for your family during a typical year?

29) How many stalks of starch bananas do you cook for your family during a typical year?

30) How many stalks of sweet bananas does your family eat during a typical year?

31) If you are an adult, how many papayas do you eat during a typical month?

32) In respect to the children, how many papayas would you expect one child to eat during a typical month?

33) How many (pounds of) sweet potatoes do you cook for your family during a typical year?

34) In respect to any other locally grown foods not previously mentioned, please list the foods and the amount eaten by the family during a typical month or year.

35) How many chickens do you kill and prepare for your family during a typical month or during a typical year?

36) In respect to wild birds, how many times do you make a meal of them during a typical month or year?

37) How many times do you make a meal of pig during a typical month or year?

38) How many times do you eat turtle during a typical month or year?

39) How many times do you eat lobster during a typical month or year?

40) How many times do you eat giant clam during a typical month or year?

41) How many times do you eat the various types of ocean snails during a typical month or year?

42) How many times do you eat octopus during a typical month or year?

43) How many times do you eat the coconut crab during a typical month or year?

44) How many times do you eat clams (other than giant) during a typical month or year?

45) Please circle the months that breadfruit is in season.

Jan.---
Feb.---
March--
April--
May----
June---
July---
Aug.---
Sept.--
Oct.---

Nov.---
Dec.---

46) Please circle the months that pandanus is in season.

Jan.---
Feb.---
March---
April---
May----
June---
July---
Aug.---
Sept.--
Oct.---
Nov.---
Dec.---

The feasibility of obtaining a total profile of a typical diet from an interview stems from the prevailing environmental conditions in which the variety of available foods is quite restricted. There is also a very limited trading economy - both the variety and availability of imported foods being restricted by the limited capital of those who import and retail such goods. Thus the limited availability of cash affects both the variety of traditional foods and the amount of contemporary imports as well. Thus, the typical diet is very "day to day". This makes it possible to obtain relatively accurate estimates on a question and answer basis.

Traditionally, one of the most respected talents is the ability to quickly divide large amounts of local food equitably among large numbers of families at island celebrations. The authors have observed the skill of both men and women at this task. Therefore, due to these environmental, economic and cultural factors, it appears that the islanders themselves may eventually produce more accurate estimates of the foods they eat than those likely to be obtained by outside observations.

A crucial problem for an outside observer is that of finding the "typical" family upon which to base his observations, since individual families consume variable amounts of local foods. Some appear to eat primarily a local diet, while that of others contain many imported foods. An analysis of the individual answers of the interviews shows the scope of this variability. However, observations indicate a large variance about the average which reflects wide variations in personal preferences for foods. This is not to suggest that direct observations, especially if made during a complete 365 day cycle, would not yield significant results - but only that such results could not be considered "average" unless observations of a large number of individuals were made. Such a study would show a "typical maximum" or "typical minimum" diet of such families, due to the fact that they would represent such extremes from the norm that they would stand out to the observer whereas the "typical average" diet of the normal family does not. Therefore an outside observer would have no way of choosing which typical family to observe.

The interview data does not provide the "typical average" of the local food consumed by the islanders of the various communities. Rather they provide estimates which approach the "typical average." An interview of forty-four questions cannot provide a direct and straight forward "typical average" of local food actually consumed. The islanders provide better estimates on food they prepare rather than on food actually eaten. Within the interview, emphasis was placed on the amounts of food prepared for the family on a weekly basis, since this was felt to be the most easily answered question to pose concerning the local diet. Since the Marshallese are by culture food gatherers they know more or less how much food they regularly gather and how much they have to cook to keep their families adequately fed. However, not all the food cooked for the family is eaten. Since there is no refrigeration, an undetermined quantity of left-overs is probably on many occasions wasted or more likely fed to pigs or in some cases chickens. Most families keep a pig or two and at least half the diet of these pigs consists of left-overs. Thus, the present study provides a more usable indication for food cooked but not necessarily eaten by the family.

Another problem in obtaining accurate estimates of food consumption is due to food sharing, which introduces a significant variable into the calculations based on the outside observer and interview methods. Food sharing is a culturally induced readiness to feed not only family members, but anyone present as well. An island society is quite open and islanders roam freely from one house to another at leisure. Thus there is a tendency to prepare a larger amount of food than needed for ones immediate family. The problem then is to estimate the amount of food given away. This is a difficult estimate to make, even for an Islander, as it is by no means a consistent amount. What is known is that the Marshallese cook regular amounts, and that they can provide reasonably accurate estimates on how much they prepare. It is not clear how much of this the family actually consumes. To try and pin the islanders down on this question during an interview is difficult. Every man knows from habit how much food he needs to regularly gather to provide for his family. He can only guess how much of this food he occasionally gives away. It was this circumstance that prompted us to concentrate our interview questions on the amount of food regularly prepared, even though it appears that some portion of this food is given away. In the authors' judgement, it seemed best to start with the most reliable estimates possible, and then to proceed from there with further study and comparison.

It should be noted then that the averages obtained from the answers to the various questions of the interview are in many cases based on food prepared for family members. Such averages are labeled per family member (PFM). They were computed by dividing the total amount of food prepared by all families by the total number of family members associated with the individual adults interviewed. Had each member of the family been interviewed (an obviously important step in future studies) the amount cooked (less the amount wasted) should be roughly equal to the total amount eaten. Thus, the problem of food sharing could have been successfully by-passed. However, due to time limitations, the inability to interview those reluctant to participate, and a concern not to inconvenience the islanders in any way meant that an inclusive study of all family members (which would entail active cooperation at all levels of the government of the Marshall Islands) has yet to be completed.

Therefore, this attempt to seek estimates from the islanders themselves concerning the actual amounts of local foods in their contemporary diet should be used not as a definitive answer to the question of what constitutes the "typical average." Rather it should be regarded as a feasibility study on the possibility of obtaining the desired information in this way. In the authors' judgement, the averages obtained from the interview study represent overestimates. They should be so considered until such time as further study proves them accurate or (more likely) provides representative estimates of food sharing and wastage, which could be folded into the study to provide more accurate consumption estimates. Until such time as the factors involved are more thoroughly understood, the feasibility of obtaining a "typical average" estimate from the interview method is in question. However, the present study establishes an upper limit, which has been confirmed by (a) an estimate of the calorie intake based on calorie value of foods (1, 2), and (b) the quantity of food that is available and is gathered on the islands.

Results

The data obtained from the interviews and observations made by the authors since 1970 suggests that the diet patterns can be divided into three typical categories or communities. These communities have the following characteristics:

Community A:

- a. Maximum availability of local foods
- b. Highly depressed local economy - living within income provided by selling copra
- c. Low population
- d. Little or no ability to purchase imported food

Community B:

- a. Low availability of local foods - except fish (which can form as much as 33% of the total diet as a result of excellent fishing in the area).
- b. Overpopulated - resulting in low per capita availability of local foods.
- c. A good supply of imported foods (supply boat comes in every two to three weeks) along with the availability of jobs.

Community C:

- a. Low availability of local foods, even the fishing is poor
- b. Large government food program

- c. Overpopulated
- d. A good supply of imported foods and availability of cash to buy them.

The results of the interviews and observations are therefore categorized according to the three communities defined above and are tabulated as follows:

Table - 1: For Community A indicating the quantities of local foods consumed

Table - 2: For Community B indicating the quantities of local foods consumed

Table - 3: For Community C indicating the quantities of local foods consumed

Results and Discussion

One of the most significant results of the dietary interview was the determination of the relative portions of local foods in the islander's diet. Tables 1 to 3 show that the amounts of local foods prepared and eaten varies considerably in each community, but that the relative proportions of the local foods which are prepared and eaten are strikingly consistent, regardless of the respective availability of imported foods in each of the three communities. With respect to imported foods, Community (A) was chosen on the basis of low availability. All islanders of this community are primarily copra producers and retain their traditional food gathering lifestyle in an area of correspondingly maximum local food availability. Community (B) was chosen because of high availability of imported foods due to the presence of a well stocked co-op store and the proliferation of government jobs. No copra is made at community (B) and as noted elsewhere in the Marshall Islands the development of a "westernized" economy results (primarily due to the limited land area) in a corresponding minimizing of local food availability. Community (C) was chosen for its large food subsidy and the low availability of local foods resulting from high population density. It is assumed that imported foods are highly available at (C), moderately available at (B) and of limited availability at (A). From Tables 1, 2 and 3 it appears that the consumption of local foods is 100% for Community A, 33% for Community B and 25% for Community C, of the total diet (local and imported food). There is a tendency for the islanders to prepare and cook less local food as imported foods become more and more available. Nevertheless, the relative portions of the local foods eaten appear to remain constant regardless of the availability of imported foods either from a "westernized" economy or a food subsidy program. This is dramatically evident when we compare the amount of coconuts (in all stages of growth and in the different modes of preparation) consumed, for example, they constitute: 55% of total local diet in Community (A), 58% in Community (B) and 47% in Community (C). The relative portions of the various other local foods seems only to change significantly due to environmental conditions. For instance, the fishing at community (B) is widely reputed to be the best in the Marshalls. This explains why fish accounts for 36% of the local diet at (B) as compared to 29% at (A); whereas the islanders at (C) (where there exists limited opportunity for fishing) estimate fish to be only 19% of the

local food they prepare for their families to eat. It may therefore be concluded that the local diet is basically quite uniform and that it changes primarily due to environmental conditions. The effect of imported food is not so much to change the elements of the local diet but simply to reduce them proportionately. The only exceptions to this tendency towards proportionate over-all reduction are Jekaru (coconut sap), Mokmok (arrowroot), and Jankwon (preserved mejwan breadfruit and preserved pandanus). This may be due to the intense labor involved in the processing and preparation of these three foods. They appear to be the first traditional foods to be replaced from a total local food diet by imported sugar, rice and flour. However, further studies are needed to conclusively demonstrate this.

With respect to community (A) where estimates showed the food prepared and eaten to be nearly 100% of the total diet, it is clear that these estimates exceed the actual amount that could conceivably be consumed, even by all the family members. This is especially so considering the fact that this group of family members includes women and children who could not possibly consume all that food on a daily basis when we know that they are eating significant quantities of imported foods as well.

Table 4A and 4B represent a typical maximum diet. It represents the most conservative estimate on the total gram weights of the various local foods which could conceivably be consumed under the assumption of a 100% local diet.

These estimates are based on the assumption that all the Marshallese living on outer islands regulate their dietary habits to a certain extent to a pattern parallel to environmental conditions and the natural food gathering cycles that are governed by these conditions. It is based on a general observation that most islanders do eat local foods. These estimates also indicate how much of a particular food is eaten (by a typical adult and child) during a given foods' peak season or seasons. They do not consider those periods when a particular food is scarce or otherwise difficult to obtain. Since these estimates are based on a cycle of one year, it seems reasonable to assume that this method could provide an estimated maximum. It has also the advantage of being based on principles and assumptions which are scientifically verifiable. The various growing seasons are subject to yearly change. Also the length and production of each growing season varies somewhat from year to year. In calculating the maximum diet the tabulations reflect a somewhat higher percentage of jekaro, coconut and pandanus than could reasonably be expected.

It should be noted that an individual existing totally on such a diet would have to be carrying out a very active food gathering existence, and would therefore have very little time for other endeavors. In short, he would have to return to the premodernized state his ancestors were living 200 years ago. It should also be noted that a higher maximum consumption of any one type of food is conceivable though it would be unlikely for two reasons. One, is the fact that the premodern Marshallese society as well as the contemporary society is very communal in its food consumption patterns. This means that food sharing is extremely important, and therefore if any one person gathers a great deal of any one particular type of food, he is more likely to divide it up and give it away.

Table 1: Community A

Interview Question No.	grams/ weeks	No. of weeks	grams/ yr	Marshallese name for food	English equivalent
1	192	52	9984	el	coconut grated for coconut milk
2	480	52	24960	Waini	coconut ripe for copra
3	1248	52	64896	Waini	coconut ripe for copra
4	1104	52	57408	Waini	coconut ripe for copra
5	7199	52	374348	drenin ni	coconut water
6	1820	52	94640	Medi	tender coconut meat
7	6440	52	334880	drenin ni	coconut water
8	2197	52	114244	Medi	tender coconut meat
9	160	52	8320	Kenawe	coconut variety-can be eaten raw
10	230	52	11960	Kenawe	coconut variety-can be eaten raw
11	1380	52	71760	iu	coconut 'apple'
12	2340	52	121680	iu	coconut 'apple'
13	1740	52	90480	iu	coconut 'apple'
14	2646	52	137592	Jekaru	nectar from coconut bud
15	225	52	11700	Jankwon	pandanus pulp
16	4158	12	49896	Bob	pandanus
17	4326	12	51912	Bob	pandanus
18	2500	11	27500	Batakatak or (Bukrol)	breadfruit different variety
18	1500	11	16500	(Bukrol)	breadfruit different variety
19	2000	15	30000	(Bukrol)	breadfruit different variety
20	1496	12	17952	Mejwan	breadfruit with seeds
21	720	6	4320	Mejwan	breadfruit with seeds
22	315	6	1890	Mejwan	breadfruit with seeds
23	300	10	3000	Mejwan	breadfruit with seeds
24	248	6	1488	Kole Nut	seeds of breadfruit
25	263	6	1578	Kole Nut	seeds of breadfruit
26	278	7	1946	mokmok	arrowroot
27	3084	52	160368	ik	fish
28			2000	punki	pumpkin
29			7500	binana	banana
30	weekly consumption not possible		7500	binana	banana
31			12120	kanapu	papaya
32	to determine as such only annual		12600	kanapu	papaya
33			364	potato	sweet potatoe
34	figures given.		7182	local vegetable foods	local vegetable foods
35			500	bao lol	poultry
36			2037	bao lin	wild bird
37			850	pik	pork
38			1000	won	turtle
39			500	wor	lobster
40			750	kabor	giant clams
41			11400	jerol	snails
42			913	kwid	octopus
43			4500	barolab	coconut crab
44			2150	clams	clams (small)

Table 2: Community B

Interview Question No.	grams/ weeks	No. of weeks	grams/ yr	Marshallese name for food	English equivalent
1	49.4	52	2569	El	coconut grated for coconut milk
2	264	52	13728	Waini	coconut ripe for copra
3	216	52	11232	Waini	coconut ripe for copra
4	144	52	7488	Waini	coconut ripe for copra
5	3611	52	187772	drenin ni	coconut water
6	702	52	36504	Medi	tender coconut meat
7	2300	52	119600	drenin ni	coconut water
8	416	52	21632	Medi	tender coconut meat
9	0.25	52	13	Kenawe	coconut variety-can be eaten raw
10	0.5	52	26	Kenawe	coconut variety-can be eaten raw
11	350	52	18200	iu	coconut 'apple'
12	700	52	36400	iu	coconut 'apple'
13	830	52	43160	iu	coconut 'apple'
14	-	-	-	jakaru	nectar from coconut bud
15	1200	13	15600	Makon (jankwon)	pandanus pulp
16	2688	13	34944	Bob	pandanus
17	1680	13	21840	Bob	pandanus
18	450	12	5400	Bukrol or	breadfruit different variety
19	-	-	1750	Batakatak	breadfruit different variety
20	245	12	2940	Mejwan	breadfruit with seed
21	380	8	3040	Mejwan	breadfruit with seed
22	272	8	2176	Mejwan	breadfruit with seed
23	-	-	-	Mejwan	breadfruit with seed
24	18.3	8	146	kole nut	seeds of breadfruit
25	40.8	8	326	kole nut	seeds of breadfruit
26	-	-	-	mokmok	arrowroot
27	1364	52	70928	ik	fish
28			-	punki	pumpkin
29			2800	binana	banana
30	weekly consumption not possible		4000	binana	banana
31			-	kanapu	papaya
32	to determine as such only annual		-	kanapu	papaya
33			-	potato	sweet potatoe
34	figures given.		-	local vegetable foods	local vegetable foods
35			1200	bao lol	poultry
36			3250	bao lin	wild birds
37			500	pik	pork
38			41	won	turtle
39			50	wor	lobster
40			4250	kabor	giant clam
41			4250	jerol	snails
42			7125	kwid	octopus
43			350	barolab	coconut crab
44			1075	clams	clams (small)

Table 3: Community C

Interview Question No.	grams/ weeks	No. of weeks	grams/ yr	Marshallese name for food	English equivalent
1	874	52	45448	El	coconut grated for coconut milk
2	264	52	13728	Waini	coconut ripe for copra
3	312	52	16224	Waini	coconut ripe for copra
4	336	52	17472	Waini	coconut ripe for copra
5	2139	52	111228	drenin ni	coconut water
6	936	52	48672	Medi	tender coconut meat
7	1035	52	53820	drenin ni	coconut water
8	286	52	14872	Medi	tender coconut meat
9	12.5	52	650	Kewane	coconut variety-can be eaten raw
10	55	52	2860	Kewane	coconut variety-can be eaten raw
11	100	52	5200	iu	coconut 'apple'
12	460	52	23920	iu	coconut 'apple'
13	240	52	12480	iu	coconut 'apple'
14	-	-	-	jecaru	nectar from coconut bud
15	200	13	2600	Mokon (jankwon)	pandanus pulp
16	1806	13	23478	Bob	pandanus
17	1680	13	21840	Bob	pandanus
18	800	12	9600	Bukrol or	breadfruit different variety
19			3300	Batakatak	breadfruit different variety
20	408	12	4896	Mejwan	breadfruit with seeds
21	225	8	1800	Mejwan	breadfruit with seeds
22	225	8	1800	Mejwan	breadfruit with seeds
23	-	-	-	Mejwan	breadfruit with seeds
24	56	8	448	kole nut	seeds of breadfruit
25	42	8	336	kole nut	seeds of breadfruit
26	-	-	-	mokmok	arrowroot
27	590	52	30680	ik	fish
28			1700	punkin	pumpkin
29			2800	binana	banana
30	weekly consumption not possible		3200	binana	banana
31			1320	kanapu	papaya
32	to determine as such only annual		2880	kanapu	papaya
33			-	potato	sweet potatoe
34	figures given.		-	local vegetable foods	local vegetable foods
35			-	bao lol	poultry
36			200	bao lin	wild bird
37			250	pik	pork
38			125	won	turtle
39			150	wor	lobster
40			-	kabor	giant clams
41			5325	jerol	snails
42			1013	kwid	octopus
43			638	barolab	coconut crab
44			1950	clams	clams (small)

TABLE 4A: MAXIMUM DIET FOR LOCAL FOODS - FOR ADULT MALES
WEEK NO. STARTING FROM JANUARY AND THEREFORE REPRESENTS SEASONS AS WELL

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Question No.																											
1	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	
2																											
3	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610		
4																											
5	6440	6440	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	10465	6440	6440	6440	6440	6440	6440	6440	
5																											
6	910	910	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	510	910	910	910	910	910	910	
6																											
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	-	-	-	-	2500	-	2500	-	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	-	-	-	-	-	-	-	-
12																											
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300		
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
16	3280	3280	3280	3280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18	2350	-	2350	2350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2350	
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	-	3500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3500	3500	3500	3500	3500	3500	3500	3500	-	
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	700	700	700	700	700	700	700	-	
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	700	700	700	700	700	700	700	-	
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	-	-	-	-	560	560	560	560	560	560	560	560	560	560	560	560	560	560	550	-	-	-	-	-	-	-	-
27	2200	-	2200	2200	2200	2200	-	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	
28	-	-	-	-	-	1250	-	1250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	875	
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
33	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
34																											
35																											
36																											
37																											
38																											
39																											
40																											
41																											
42																											
43																											

Weekly consumption not possible to determine as such, only annual figures given.

Weekly consumption not possible to determine as such only annual figures given.

TABLE 4A: MAXIMUM DIET FOR LOCAL FOODS - FOR ADULT MALES
 WEEK NO. STARTING FROM JANUARY AND THEREFORE REPRESENTS SEASONS AS WELL
 (CONTINUED)

Week	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Question No.																									
1	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	
2																									
3	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	
4																									
5	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	6440	
6																									
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	-	-	-	-	-	-	-	-	-	2000	-	2000	-	2000	-	2000	2500	2500	2500	2500	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	6300	
15	-	-	-	-	-	-	-	-	-	-	900	900	-	900	-	900	-	900	-	900	-	900	-	900	-
16	3280	3280	3280	3280	3280	3280	3280	3280	3280	3280	-	-	-	-	-	-	-	-	-	-	-	3280	3280	3280	
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18	2350	2350	2350	2350	2350	2350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2350	-	2350	-	-
19	-	-	-	-	-	-	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
22	-	-	400	-	-	400	-	-	400	-	400	-	400	-	400	-	400	-	400	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
27	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1250	-	1250	
29	-	875	-	-	875	-	-	875	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	875	-	-	875	-	-	875	-	-	875	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
33	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Weekly consumption not possible to determine as such only annual figures given.

Table 4B: Summary of Maximum Diet (Annual Consumption)

Question No.	Grams/Week	No. Weeks	Grams/Year	Marshallese	English
1	266	52	13832	EL	coconut grated for coconut milk
2				Waini	coconut ripe for copra
3	1610	52	83720	Waini	coconut ripe for copra
4				Waini	coconut ripe for copra
5	6440	36	231840	drepin ni	coconut water
5	10465	16	167440	drenin ni	coconut water
6	910	25	22750	Medi	tender coconut meat
6	2275	27	61425	Medi	tender coconut meat
7	-	-	-	drenin ni	coconut water
8	-	-	-	Medi	tender coconut meat
9	300	52	15600	Kenawe	coconut variety-can be eaten raw
10	-	-	-	Kenawe	coconut variety-can be eaten raw
11	-	-	-	iu	coconut 'apple'
12	2000	4	8000	iu	coconut 'apple'
12	2500	20	50000	iu	coconut 'apple'
13	-	-	-	iu	coconut 'apple'
14	6300	52	327600	jekaru	nectar from coconut bud
15	900	8	7200	Makon (jankwon)	pandanus pulp
16	3280	16	52480	Bob	pandanus
17	-	-	-	Bob	pandanus
18	2350	12	28200	Bukrol or	breadfruit different variety
19	450	15	6750	Batakatak	breadfruit different variety
20	3500	9	31500	Mejwan	breadfruit with seed
21	700	5	3500	Mejwan	breadfruit with seed
22	400	7	2800	Mejwan	breadfruit with seed
23	-	-	-	Mejwan	breadfruit with seed
24	700	5	3500	kole nut	seeds of breadfruit
25	-	-	-	kole nut	seeds of breadfruit
26	560	14	7800	mokmok	arrowroot
27	2200	50	110000	ik	fish
28	1250	4	5000	punki	pumpkin
29	875	4	3500	binana	banana
30	875	4	3500	binana	banana
31	100	52	5200	kanapu	papaya
32	-	-	-	kanapu	papaya
33	100	52	5200	potato	sweet potatoe
34	weekly consumption not possible to determine as such only annual figures given.	4375	-	local vegetable foods	local vegetable foods
35				bao lol	poultry
36				bao lin	wild bird
37				3500	pik
38				1750	won
39				1750	turtle
40				7000	wor
41				7000	kabor
42				8679	jéröl
43				5250	kwid
				7000	barolab

rather than consume a large portion of it himself. Second, the acceptance of food offered is also a very important part of the culture, and therefore it would be very difficult for an individual to isolate his food gathering and consumption patterns from those of the society at large. This latter point is especially true for foods which have limited availability, such as, breadfruit, pumpkin, papaya, bananas, potatoes and during certain times, pandanus and fish. Coconuts and jeckaru on the other hand can be gathered in significant quantities at all times. It is therefore much more likely that a maximum (a totally local) diet would be based on them.

If it is assumed that Tables 4A and 4B represent the maximum amount of local foods consumed, and that whatever imported food is eaten will have a tendency to displace proportionate amounts of local foods, then in principle a "typical average" diet could be established. This could be done by subtracting the caloric content of imported food from the total calories of local food consumed per year as shown on the maximum table, and then converting the difference to gram weights using calorie to gram conversion factors for the local foods. By using this method, one can derive the typical amount of local food that could be expected to be consumed in addition to the imported food eaten. Table 5 derives this diet pattern and also presents the averages for the different age groups and sexes.

In summary the results of the study establish maximum estimates of the consumption of local foods, based on the amount of local food that an islander living a traditional life and a totally local diet could consume. These estimates could be further refined by the use of calorie conversion factors specific to the Marshall Islanders and specific to the local food they consume. With reference to the contemporary diet or "typical average" we are continuing our study in two ways. One is by the utilization of the interview method in an attempt to determine the full range of local food consumption in combination with studies of food wasting and food sharing. A second is by the determination of the quantity of imported food consumed in these same communities. In other words, we are suggesting a double approach which would attempt to determine the contemporary diet from opposite directions. This could produce either two corresponding figures or more likely, two reliable figures between which the contemporary or "typical average" diet of the islanders in the community in question would lie.

Table 5: Typical Average Diet as a Function of Age and Sex in Comparison to the Maximum Diet (g/yr).

Question No.	Maximum Diet g/yr. (Table-4)	Male				Woman				Marshallese name of Food	English Equivalent
		Male (11-22 yrs.)	Male (23-50 yrs.)	Child (11-14 yrs.)	Woman (7-10 yrs.)	Woman (15-22 yrs.)	Woman (23-50 yrs.)	Child (4-6 yrs.)	Child (1-3 yrs.)		
1	13832	12864	12449	11066	9682	9129	8299	5948	EI	coconut grated for coconut milk	
2									Waini	coconut ripe for copra	
3	83720	77860	75348	66976	58604	55255	50232	36000	Waini	coconut ripe for copra	
4									Waini	coconut ripe for copra	
5	399280	371330	359352	319420	279496	161754	239568	171690	drenin mi	coconut water	
6	8*175	78293	75758	67340	58923	55556	50505	36195	Medi	tender coconut meat	
7	-	-	-	-	-	-	-	-	drenin mi	coconut water	
8	-	-	-	-	-	-	-	-	Medi	tender coconut meat	
9	15600	14508	14040	12480	10920	10296	9360	6708	Kenawe	coconut variety-can be eaten raw	
10									Kenawe	coconut variety-can be eaten raw	
11									iu	coconut 'apple'	
12	58000	53940	52200	46400	40600	38280	34800	24940	iu	coconut 'apple'	
13									iu	coconut 'apple'	
14	327600	304668	274201	262080	229320	216216	196560	140868	jakaru	nectar from coconut bud	
15	7200	6696	6480	5760	5040	4752	4320	3096	Makon (jankwon)	pandanus pulp	
16	52480	48806	47232	41984	36736	34637	31488	22566	Bcb	pandanus	
17									Bcb	pandanus	
18	28200	26226	25380	22560	19740	18612	16920	12126	Bukrol or	breadfruit different variety	
19	6750	6278	6075	5400	4725	4455	4050	2902	Batakatak	breadfruit different variety	
20	31500	29295	28350	25200	22050	20790	18900	13545	Mejwan	breadfruit with seed	
21	3500	3255	3150	2800	2450	2310	2100	1505	Mejwan	breadfruit with seed	
22	2800	2604	2520	2240	1960	1848	1680	1204	Mejwan	breadfruit with seed	
23									Mejwan	breadfruit with seed	
24	3500	3255	3150	2800	2450	2310	2100	1505	kole nut	seeds of breadfruit	
25									kole nut	seeds of breadfruit	
26	1840	7291	7056	6272	5488	5174	4704	3371	mokmok	arrowroot	
27	110000	102300	99000	88000	77000	72600	66000	47300	ik	fish	
28	5000	4650	4500	4000	3500	3300	3000	2150	punki	pumpkin	
29	3500	4650	3150	2800	2450	2310	2100	1505	binana	banana	
30	3500	3255	3150	2800	2450	2310	2100	1505	binana	banana	
31	5200	4836	4680	4160	3640	3432	3120	2236	kanapu	papaya	
32									kanapu	papaya	
33	5200	4836	4680	4160	3640	3432	3120	2236	potato	sweet potatoe	
34									local vegetable foods	local vegetable foods	
35	4375	4069	3938	3500	3063	2888	2625	1881	baolol	poultry	
36	1750	1628	1575	1400	1225	1155	1050	753	baolin	wild bird	
37	5500	3255	3150	3800	2450	2310	2100	1505	pik	pork	
38	1750	1628	1575	1400	1225	1155	1050	753	won	turtle	
39	7000	6510	6300	5600	4900	4620	4260	3010	woc	lobster	
40	7000	6510	6300	5000	4900	4620	4200	3010	kabor	giant clam	
41	6679	8071	7811	6943	6075	5728	5207	3732	jerol	snails	
42	5250	4883	4725	4200	3675	3465	3150	2258	kwid	octopus	
43	7000	6510	6300	5600	4900	4620	4200	3010	barolab	coconut crab	
44	-	-	-	-	-	-	-	-	clams	clams (small)	

List of Local Foods and Conversion Factors

- 1) Coconut milk - el - One nut produces 38 grams of milk¹ at 2.6 cal/g.² A solution produced by squeezing freshly grated coconut. Often water is mixed with the coconut gratings to enhance the extraction process. Coconut milk can be used to enrich all traditional dishes and is normally mixed into food before cooking. EL is produced from waini (the mature nut).
- 2) Coconut meat - waini - one nut = 240 grams³ at 3.1 cal/g.⁴ (12 months stage). Often grated and mixed into food but more often eaten as a side dish with breadfruit or fish.
- 3) Coconut water - dren in ni - 230 grams/nut at .109 cal/gram.⁵ The water of the immature coconut at its 7 to 9 month stage is consumed by islanders of all ages regularly when available. The ni must be cut from the tree as opposed to waini which falls by itself. Certain varieties of ni are preferred among others for regular drinking, some varieties being seldom or never consumed.
- 4) Coconut Flesh - medi - 130 grams/nut at 1 cal/gram.⁶ Medi is the soft flesh which forms inside the shell of the ni stage. It is seldom used in cooking and eaten primarily as an in between meal snack.
- 5) Kenawe - 100 grams/nut at .109 cal/gram. Kenawe comes from a particular variety of coconut palm of which the immature, 3 to 5 month stage fruits are sweet to the taste and edible. The shell is soft at this stage and eaten like raw cabbage. The husk in its upper portion at the eye is also edible. The lower portions of the husk are chewed and the juice sucked and then these portions are discarded. Both gram weight and calorie content listed above are estimates as no data on kenawe have been published.
- 6) Sprouted embryo - iu - 100 grams/nut at .78 cal/gram.⁷ The embryo begins to form around the 15th month of the waini stage, and normally takes two to three months to sprout. When the sprouted nuts are used in copra making the iu is first removed before the nut is set out to dry. It is often cooked in a pot with flour and coconut milk. Sometimes it is baked still within the shell. More often it is simply eaten raw mixed with sugar water or zekaru as a meal or plain as a snack.
- 7) Jekaru - .45 cal/grams.⁸ Jekaru is the sap of the tree tapped from the flower while still at the bud (4 week) stage. Up to one gallon of Jekaru can be produced from one tree per day. Jekaru is used as a sweetener in cooking and it is drunk by children and adults fresh in a solution of 50% water. Fermentation begins immediately. It is often boiled and given to babies as a substitute of mother's milk. Unless the fermentation process is arrested it turns into a wine by about 36 hours. Fresh jekaru is often boiled into a syrup called Jekami.
- 8) Pandanus (preserved) - Jankwon - 9.93 cal/gram.⁹ Jankwon is produced by mashing the cooked pandanus keys into mokon, straining out the fibers which were loosened from the cores in the process, baking the resulting mash into

a deep brown paste like substance and drying this under the sun until it is dehydrated to the point where preservation is possible. It is then wrapped in dry pandanus leaves and tied into a neat roll until needed.

- 9) Pandanus keys - bob. There are two basic types pf pandanus. One is used to mash into mokon and averages about 50 grams per key;¹⁰ another type is sel-dom cooked, contains little pulp and only about 30 grams of juice. This latter type is typically eaten raw by chewing and sucking and then discarding the inedible core. There are about 40 keys to a stalk. No known reliable calorie comparison factors for this latter type of pandanus key exist so we have used .58 calories/g.¹¹ for both types has been assumed even though this is an overestimation for the latter. Depending on location (island/atoll) pandanus is eaten consistently for 4 months.¹²
- 10) Breadfruit - batakatak, bukrol. These are the seedless varieties of breadfruit. They contain about 500 grams of cooked edible portion at 1.3 cal/gram.¹³ Three types of breadfruit are eaten consistently over a period of about 12 weeks per year.¹⁴
- 11) Preserved breadfruit (batakatak and bukrol) - buido - 1.3 cal/gram with one fruit equal to 500 processed grams of buido.¹⁵ The breadfruit is picked in large numbers at the peak of season, skinned, and decored, sliced and soaked within a copra sack in the lagoon for a period of hours or days. The sliced fruits are then mashed and allowed to sit and ferment underground within breadfruit leaves where drainage can take place. Before eating it is often rinsed in fresh water to reduce the salt content.
- 12) Breadfruit (variety with seeds) - Mejwan - 272 grams/fruit at 1.12 calories/gram, cooked and 1.22 calories/gram eaten raw.¹⁶ Mejwan is always cooked in its unripe stage though unlike other varieties of breadfruit when ripe it can be eaten raw. It can also be prepared into Jankwon by baking the ripe fruits and then drying them under the sun. The jankwon so produced contains about 2.83 calories/gram.¹⁷ Mejwan is eaten consistently for about 9 weeks/yr. in its unripe stages and for about 5 weeks/yr.¹⁸
- 13) Breadfruit seeds (from mejwan) - Kole - each nut weighs about 2.5 grams and contains about 1.5 cal/gram.¹⁹ The nuts must be cooked to be eaten, and can be considered as a significant portion of the diet for only about 5 weeks per year.
- 14) Arrowroot - Mokmok - 3.5 calories/gram.²⁰ The tubers are dug up in the winter months when the plant itself dies. They are dumped into a copra sack and rinsed of dirt in the lagoon. They are then grated into pulp which is mixed with salt water and strained to separate the starch out of the solution. The solution containing the starchy material is usually trapped in a canvas lined pit which permits the salt water to seep through the canvas into the sand leaving the chalky starch behind which resembles plaster of Paris. The starch is then wrapped in a towel and hung up to drain and dry. It can then be used in cooking without further processing.

Footnotes for List of Local Foods and Conversion Factors.

1. Murai, Mary. Some Tropical South Pacific Island Foods, University of Hawaii Press, Honolulu, Hawaii, 1958;118.
2. Ibid 118
3. Ibid 52-7. (Murai documents the average weight of the mature coconut at 350 grams. However, as most of the coconut eaten is grated and as only 2/3 of this amount is actually extracted from the shell, we have reduced Murai's figure by 1/3 to 240 grams/nut.)
4. Ibid 52-7
5. Ibid 52-4
6. Ibid 52-4
7. Ibid 52-8
8. Ibid 58
9. Ibid 76
10. Ibid 67-82
(Murai documents the average edible portion of a pandanus key at 75 grams. There are many dozens of variety of pandanus eaten in the Marshall Islands, however, though the two varieties used in Murai's study happen to be the largest. We feel 50 grams/key for the variety which produces mokon and 30 grams/key for the other type to be more accurate overall average.)
11. Ibid 58
12. See page (5 & 6) of Dietary Interview.
13. Murai, Mary. Some Tropical South Pacific Island Foods, University of Hawaii Press, Honolulu, Hawaii, 1958;24-30.
14. See page (5 & 6) of Dietary Interview.
15. Murai, Mary. Some Tropical South Pacific Island Foods, University of Hawaii Press, Honolulu, Hawaii, 1958;24-30.
16. Ibid 24-30
17. Ibid 24-30
18. See page (5 & 6) of Dietary Interview.
19. Murai, Some South Pacific Island Foods, University of Hawaii Press, Honolulu, Hawaii, 1958;34.
20. Ibid 104.

Living Pattern Study:

The living patterns among the Marshall Islanders vary somewhat from atoll to atoll. However, due to the consistency of an atoll environment and its limited land area, as well as the limitations it presents to economic development, reliable estimates can be produced if based on the average amount of time spent at the various tasks necessary for subsistence. Tables 6, 7, 8 list the time spent in various activities by males (ages 15-50 years), females (ages 15-50 years) and children (ages 6-14 years).

From information provided by the Tobolar Copra Plant which keeps copra production works for the various atolls in the Marshalls, it has been determined that the islanders of Utirik Atoll produced about 113 short tons of copra between the Fall of 1957 to the Fall of 1978. Thus this averages to about 90 lbs./week per person. This copra production represents the output of 48 males from ages 14 to 95. As all of these individuals are not involved in copra production to the same extent, it is estimated that those actually working produced about one bag (between 100 and 125 lbs.) per week. This per capita production at Rongelap seemed to be considerably less, while at Ailuk it proved somewhat more. At any rate copra production - the main island commercial activity - could not possibly exceed that possible during the hours taken for coconut collecting and husking per week which we have used as the basis for island activities estimates. It has been estimated that plantation clearing (for undergrowth) adds another 4 hours per individual per week to inland activities associated with copra production. In addition to copra production, another two hours per day of inland activity has been estimated for food gathering.

This is not to say that some individuals do not spend considerably more than 26 hours/week inland. The apparent range over the entire male population is very broad, with some individuals spending in excess of 40 hours and others as little as 7 or less.

The living patterns of women on the other hand, are noteworthy in the relative lack of inland activity. Some of the younger women are involved in coconut gathering, and, to a limited extent, food gathering. Some of the elderly women are engaged in activities related to handicraft production, (such as gathering of pandanus leaves).

Female activities on the lagoon, at the shoreline and on other small islands of the atoll appear to be an insignificant portion of their living patterns. An exception to this is found only when actual settlement of a small island for copra making purposes takes place. In general, women do not go along on the two to three day trips which the men periodically make for cleaning up of the coconut plantation area.

In respect to male activities in the area of ship repair, a direct relationship was apparent between the number and state of repair of traditional canoes and other vessels and the amount of time spent on the lagoon and at other islands.

Shore time activities for men are primarily limited to fishing with throw nets, long nets and cane poles.

On the other hand children spend long hours playing on the beach and in the sand. It was estimated that as a minimum, they occupy this area during two hours of daily activity.

From the above discussion it can be seen that by far the largest amount of time in the living pattern of the islanders is spent within the village area. During the largest proportion of it (45 to 49 hours), they are involved in child raising, handicraft fabrication and relaxation. Indeed it is a rare instance when one stops at an islander's house to find no one there. Such situations occur only during major celebrations or during the arrival of a trading vessel.

To understand the leisurely pace of life on the outer atolls of the Marshalls, it is perhaps best to pay attention to the subsistence activities, and the life and culture supporting functions which are based upon the coconut palm. The palm has been said to be the mother of Pacific man and truly it is the pillar upon which island life revolves. From the preceding section on diet, it is apparent that by the islanders own estimate, the coconut palm provides from 48 to 58 percent of the food for the traditional as well as the contemporary local diet. Fish, which can also be gathered quickly and in great abundance constitute the second major portion of the diet and the other main support for island life and culture. Together these two items provide from 78 to 84 percent of the local food diet. It is upon the availability of these staples, which the environment provides abundantly, that atoll life, as we know it today was established. Even though many of the subsistence skills which enabled the ancestors of the present islanders to thrive and establish their once self-reliant culture have been lost, and though the islanders can in no sense be considered or expected to be totally self-sufficient in terms of their diet, the local food resource foster and support this leisurely pace of life. They can be expected to turn to it in lean times, when for one reason or another the much preferred rice, sugar and flour imports become scarce or unattainable.

Table 6: Male Activities
(15-50)

<u>A. Inland activities - (26 hrs./week)</u>	<u>hrs./week</u>
1. Brushing plantation	4
2. Coconut collecting	4
3. Coconut husking	4
4. Food gathering of pandanus, breadfruit, <u>ni, iu, Jekaru</u>	<u>total (A)</u> <u>14</u> <u>26</u>
<u>B. Activities on lagoon (9 hrs./week)</u>	
1. Fishing on lagoon	7
2. Inter atoll travel (0-2 hrs.)	
	<u>total (B)</u> <u>2</u> <u>9</u>
<u>C. Activities at shoreline (7 hrs./week)</u>	
1. Fishing at shoreline	<u>total (C)</u> <u>7</u>
<u>D. Activities on other island (2 hrs./week)</u>	<u>total (D)</u> <u>2</u> (0-2 hrs.)
<u>E. Activities in Village area (124 hrs./week)</u>	
1. Canoe and net making and repair	4
2. Clean up of living area	7
3. Coconut cutting and drying	4
4. Church activities, meetings, celebrations	8
5. Sleeping	56

Table 6: Male Activities (Cont'd)

(15-50)

hrs./week

6. Child rearing (and monitoring), handicraft, relaxation	<u>45</u>
total (E)	124
Total (A-E)	168

Table 7: Female Activities
(15-50)

A. <u>Inland activities (8 hrs./week)</u>	<u>hrs./week</u>
1. Coconut gathering and splitting, gathering total (A)	<u>8</u>
pandanus leaf	
B. <u>Activities on lagoon (none)</u>	total (B) nil
C. <u>Activities at shoreline (insignificant)</u>	total (C) insignificant
D. <u>Activities on other islands (insignificant)</u>	total (D) insignificant
E. <u>Activities in village area</u>	
1. Preparation of food	28
2. Splitting coconut shells and drying	4
3. Clean up of living area	7
4. Washing clothes	8
5. Church activities, meetings and celebrations	16
6. Sleeping	56
7. Child rearing, handicraft, relaxations	<u>49</u>
	total (E) 160
	Total (A-E) 168

Table 8: Children (ages 6-14)

<u>A. Inland Activities</u>	<u>hrs./week</u>
1. Collecting <u>iu</u> , gathering coconuts	total (A) 10
<u>B. Activities on lagoon</u>	
1. Inter Atoll travel (0-2 hrs.)	total (B) 2
<u>C. Activities at shoreline</u>	
1. Play	total (C) 10
<u>D. Activities on other islands (0-2 hrs.)</u>	<u>total (D)</u> 2
<u>E. Activities in village area</u>	
1. School	30
2. Clean up of living area	4
3. Washing clothes or drying copra or household chores, etc.	26
4. Sleeping	52
5. Play and relaxation	<u>32</u>
	total (E) 144
	Total (A-E) 168

References:

1. Murai, Mary (1954). Nutrition Study in Micronesia. Atoll Research Bulletin #27. Pacific Science Board, NAS - NRC. Washington, D.C.
2. Murai, Mary, F. Pen, and C.D. Miller (1958). Some Tropical South Pacific Island Foods. University of Hawaii Press, Honolulu.
3. Personal Communication Notes:
 - a. E.E. Held, University of Washington (May 1958)
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5. Robinson, W.L., W.A. Phillips and C.S. Colsher (1977). Dose Assessment at Bikini Atoll. Report #UCRL-51879 Pt. 5. Lawrence Livermore Laboratory, Livermore, California.
6. USAEC (1973). Enewetak Radiological Survey. Report #NVO-140 Volume 1. Nevada Operations Office, Las Vegas, Nevada.

Appendices

- A. Seasons: i. Local foods
ii. Seasons of the year
- B. Marshallese (local) foods
- C. Other Islands used for food gathering
- D. Data on edible portions of Marshallese foods
- E. Fishes: Types of fishes and methods of fishing
- F. School children - lunch program
- G. Typhoon relief
- H. Food supply ships - trip reports
- I. Private or community stores - types of foods available

Appendix A
SEASON (WOTON) - Local Foods

Pandanus - various observations

<u>Spokesman</u>	<u>Ripens</u>
	1a) June - July, b) November - January
Nagal - Ailuk	2a) June - July, August, September, b) November, December January, February
Cement - Ailuk	3a) April, May, June, July, b) December, January, February
Cement - Ailuk	4) all year June - December
Paul - Rongelap	5) 8 months September/October - April/May
Jotai - Rongelap	6) May, June, July (begins growing January)
Ailuk	7a) June, July, b) November, December, January
*	8) October, December, January but some ripens throughout year in small numbers
Henas - Rongelap	9) December begins to grow/March, April ready to eat
Ailuk	10) January, February, April, May, June, July, August, September

Comments: during a drought-smaller and smaller fruits

Breadfruit - various observations

<u>Spokesman</u>	<u>Ripens</u>
Henas - Rongelap	1) May, June, July, August, September, (little October) 2a) June, July, b) December, January
Nagal - Ailuk	3) April, May, June, July, August
Cement - Ailuk	4a) June, July, August, September, b) December, January
Ailjen - Ailuk	5a) June, July, b) December, January 6a) summer, b) November, December
Rongelap	7a) July, August, September, b) December, January 8) May - September, peak May through July some be may be present until December

*Bryan Jr., E. H., Life in the Marshall Islands, p. 129.

SEASON (WONTON) (cont'd)

9) December, January, February, April, May, June, July
(mokan)

Comments: After a breadfruit season, pandanus follows. They alternate seasons.
(Nagat - Ailuk)

Bananas - various observations

Spokesman

Nagal - Ailuk all year around

Hemos - Rongelap all year - more in rainy season

Arrowroot

Spokesman

Hemos - Rongelap November, begins growing, December and January ready to eat

Nagal - Ailuk December, January, February

* October through January

Rongelap January, February, March, April

Coconut - iu (flowering coconut)

Spokesman

Nagal - Ailuk whenever anybody wants to find and eat it

Pumpkin

Spokesman

Nagal - Ailuk all year

Cement - Ailuk all year

Sue - Rongelap all year
1 month for pumpkin to become large

*Bryan Jr., E. H., Life in the Marshall Islands, p. 129.

Cement - Ailuk

Pandanus Season - January, February, March, April, May, June, July, August, September

Pandanus Types

First pandanus season beginning March-end of May	Jablower Kobarwa
Second pandanus season beginning of June- end of August	Lejokrer Lokotwa Lebo
Third pandanus season beginning of September- end of November	Edmerma Leomtur Ailuk Kemelij Lemoen
Fourth pandanus season beginning of January- end of March	Lekman Lejmuu Liman Mojel Wottet Nibun

The information given by the Marshallese seems to show two seasons for both breadfruit and pandanus. This is a widely accepted fact and tends to support our own observations made during our extended stay on the islands in the Marshalls. According to the above figures, one would expect that the summer season, which bears the largest crop and is the time when preserving is normally done, begins around the second week of May and continues progressively until July--the month when the preserving is traditionally done and continues on into the second or third week of August. The second or winter breadfruit crop falls in December and January.

It should be noted that the pandanus season is markedly different in the Northern Marshalls where due to lack of rain in the winter months, the summer crop is normally much larger. To some extent, this holds true for breadfruit as well--the winter crop being much smaller.

SEASONS (WONTON) (cont'd)

Taro

Spokesman

Nagal - Ailuk grows all year

OBSERVATIONS ON SEASONS OF YEAR

Summer

season of maximum rainfall in the year*

rainy season on Ailuk May, June, July, August; slows down September, October, November, December

Rainfall

decreases as you go north

average rainfall: Jaluit - 160" Wake Island 30 to 50"
(350 miles further north)
Majuro - 120"
Ujelang - 80"
Eniwetak - 60 to 70"*

Winter

December - April, season of strong winds from the northeast.
Dry period of the year.*

Temperature °F

range varies less than 10-12°*

Minimum: 68°

Maximum: 80°

* Bryant Jr., E. H., Life in the Marshall Islands, p. 135-36.

Marshallese Foods

a: Marshallese names for food types

Local Foods

breadfruit - ma
 coconut
 drinking - ni
 copra - waini
 oldest stage - iu (sprouted)
 pandanus - bob
 arrowroot - mokmok
 taro - iaroj
 pumpkin - baanke
 papaya - keinabbu
 banana - pinana
 sweet potatoe
 coconut sap - jekeru
 chicken - bao
 pig - piik
 turtle - won
 fish - ek
 clams - kapwor
 lobsters - wor
 birds - baao
 coconut crabs - barulep
 eggs - lcp
 turtle
 bird
 chicken

Imported Foods

rice - <u>raij</u>	sugar
flour - <u>pilawa</u>	soy sauce
can - <u>kuwat</u>	mayonnaise
tuna - <u>bwebwe</u>	yeast
chicken - <u>baao</u>	baking powder
beef - <u>cow</u>	candy - M&M's, gum, chocolate bars
mackerel	coffee
cornbeef	tang
sardine	tea
vienna sausage	milk - Carnation Instant
spam	
beef hash	
biscuits - ship, crab	
Ramen soup	
peanut butter	
kim chee	
shortening	

b: Cooking Modes

- (1) Ground oven - UM - The ground pit is fueled by a coconut shell or husk fire. Rocks are then added to cover the coals. When the rocks have been warmed the food is placed in. The pit is covered over with banana leaves, canvas or a heavy rubber sheet. Weights are added.
- (2) Stove Type Cooking - is always done either over a kerosene stove or an open fire fueled by coconut shells or husks.
 - a) boiling - using rainwater, brackish water when rainwater supply is low.
 - b) frying - using Crisco, other shortenings, occasionally pig grease, rarely if, ever coconut oil.
 - c) steamed -
- (3) Roasting - is done over a coconut shell or husk fueled fire, when it has turned to coals.

c: Description of the Food Types

1. Breadfruit - MA

- (1) Kwanjin - green breadfruit roasted on coals until skin is black. The outside is then scraped with pieces of broken glass or shell. Approximately 1½ hours to cook.
- (2) Steamed - fill the iron pot with water up to metal disk. Cooking time varies according to type being cooked.
 - a) bwiro - 2 hours to steam on fire
 - b) raw breadfruit (whole) 30 minutes by stove
- (3) Boiled - wash green breadfruit leave whole and boil.
- (4) Kopjar - baked breadfruit in ground oven.
- (5) Jokkwapin Ma - Breadfruit soup is made by removing the core and skin, cutting the rest into pieces which are boiled, mashed, mixed with coconut milk and salted to taste.
- (6) Fried - Cut the ripe breadfruit into slices removing the outer green peel. Soak the wedges in salt water or salt them before frying. Cooking time approximately 10 minutes on each side until brown or french fried.
- (7) Kalo - very ripe breadfruit mixed with coconut milk.
- (8) Mijiwan - a type of breadfruit which is eaten raw when it is very ripe; as is or with coconut milk.
- (9) Kwolejiped - name of nuts (kwole) cooked. They are roasted on coals or taken out of a steamed, baked, or boiled Mijiwan Breadfruit.

(10) Bwiyo - preserved breadfruit or Marshallese cheese. The skin is removed from the ripe green breadfruits then cut in wedges and placed in a burlap bag and taken to the lagoon. The bag is anchored for one or two days in the saltwater or stomped on for an hour or so to hasten the fermentation. The bag is then taken from the water and left on coconut leaves in the open air for one or two days. The breadfruit is then placed in a pit lined with breadfruit leaves. Leaves, a cloth cover and weights are then placed over the breadfruit. The breadfruit leaves are changed after every month and the bwiyo is ready for cooking after two months. Supply can be kept six months to a year or two. (Type of breadfruit used--bakrol, batatak, koutroro.)

Bwiyo Food Preparation

The quantity of preserved breadfruit that is needed to cook with is taken from the pit or box and thoroughly washed in fresh water. Coconut milk is then mixed with the rainwater. Sugar is also added along with flour which is optional. A ladle full of the mixture is then placed in a breadfruit leaf and is either steamed, boiled, or baked. Another method of cooking is to roll the bwiyo into balls and then steam or boil.

(11) Baked - The inside stem of a ripe breadfruit is removed and coconut milk replaces it. The breadfruit is then wrapped in leaves and baked.

(12) Jankwin - Mijiwan seeded breadfruit is picked green; allowed to ripen; seeds, core and skin removed; placed in a coconut leaf basket; baked in earth oven all night; taken out; unwrapped; flattened and allowed to dry in sun. When dry, it is rolled, wrapped in pandanus leaves, tied with sennit twine and preserved as a roll.

2. Coconut

The coconut was traditionally and still in some circumstances continues to be the focal point upon which the Islander's diet revolves. Indeed nothing is found in greater abundance among the atolls than coconut. The tree itself was an important foundation upon which Island life evolved. The leaves being woven into shelters and the fibrous strands of the husk twisted into sennit rope for the lashings of houses and outrigger canoes. The bud-sheath was used as a bowl in which to pour ingredients to bake in ground ovens. Baskets woven from the leaflets of the tree were, and occasionally still are, commonly used for eating and displaying and transporting food.

The coconut fruit requires approximately 12 months to ripen and usually falls off itself after an additional few months due to stem decay. At this stage it is ready to be husked, broken open and dried under the sun or in a smoke-house into copra, the major island export. And at this stage it can be opened and the nut cut from the shell and eaten as jiral (with something else) fish, for instance or breadfruit or both. It has a high oil content however and a two to four ounce portion is seldom exceeded unless there is a scarcity of imported or other local foods. Children seem to eat considerably more of it than adults do. The elderly, on the other hand, especially those lacking teeth, eat it normally only when it is mixed into the family food. Binbin is a term that is used to describe the preparation of a variety of dishes in which mashed banana or tarro or breadfruit or more likely rice, is formed by hand into a ball and rolled over coconut gratings which stick to the surface and help preserve its shape. These gratings are produced in a process called ranke whereby the nut is scraped from its shell by a rounded, tooth edged blade normally screwed onto a stool on which one can sit while engaged at the grating or ranke process.

The water of the mature coconut or waini is sometimes drunk. More often, however, it is mixed with food as an ingredient before cooking or not being as sweet or flavorful as the water in the unripe nuts discarded altogether. The earliest stage at which the water begins to sweeten and is used for drinking is termed obleb--around its sixth month of growth. The shell is still soft enough to break with the fingers and the nut itself--if it has started to form at all--is but a thin gelatin lining the bottom of the shell that can be loosened with a thumbnail and drunk. The next stage when the gelatin hardens as does the shell allowing itself to be husked is called ni. This is the stage at seven to nine months when the nut is normally used for drinking. During this period, the nut continues to form though its texture remains soft and removable from the shell by the thumbnail. When it becomes too hard for this and begins to become cemented to its shell at around nine to ten months, it is called mejob. The meat of the nut is hard though not quite as hard as in the mature, waini, stage and not as oily. Mejob is seldom eaten today though it was in the past and may one day again be a staple to ward off hunger in times of famine. This is due to its abundance and to the fact that the lower oil content allows for a larger quantity to be eaten before bringing distress to the bowel. It can be grated by the ranke process and is sometimes used in this way mixed as an ingredient into food or put in a bowl with jeckaro and eaten as a sort of cereal called jeckbwa.

Jekaro is a nectar collected by binding and repeatedly (morning and evening) cutting the budding composit flower of the coconut tree. As the tree produces one bud a month and as a bud can be tapped for a period of up to four months, a good

tree can have up to four bottles containing up to a gallon of kekaro hanging and waiting to be collected each morning. The tree will produce a similar quantity that must be collected in the evening. It is very sweet and is usually mixed with water for drinking and very nutritious, especially after four to six hours at which point the yeast content is greatest. After this it begins to become noticeably alcoholic and at 36 hours when the fermentation process stops, it can be drunk as a wine. In its sweet, unfermented stage it has been used as a substitute for mother's milk. When available, it can be used as a sweetener in any or all of the traditional dishes. When it is boiled down, it yields on an eight to one ratio a delicious syrup termed kekami which is used as a sweetener in drinking and also eaten with coconut at its various stages. It can be mixed and further cooked with coconut gratings to produce a type of coconut candy, much prized, called amitama.

At around the 15th to 18th month, the coconut begins to sprout. At this time, the inside of the nut turns gradually to a sweet apple-like, spongy substance called iou. A side product in copra making, it is eaten in the interior islands by those gathering the nuts. Then again eaten by those while husking. When the nuts are cracked, children flock to the area to scoop out the soft iou before the nuts are layed out under the sun. Iou is sometimes crushed and mixed raw with kekaro and thickened with flour into a pudding--aikiou. Also it can be steamed or baked in a basket (iutur) or even while still in the nut (umum ilo lot).

To the aikiou dish el is often added. Indeed it is through the el or famous "coconut milk" that the coconut can be seen as the central ingredient in all traditional cooking. El is obtained by mixing the grated coconut or waini with a little water and squeezing. Much of the oil and a great deal of flavor is thereby released into solution--pure white in color. El can, and often is, mixed into every dish conceivable. When available, it is normally mixed into the rice on a daily basis at the rate of about one coconut per two cups of rice.

Coconut - ni

ni - 1 to 5 months growth

1) young drinking

method - drink through hole in husk, shell too fragile to husk, gelatinous coconut meat

2) mature drinking coconut

method - husk coconut before drinking coconut meat firm, use knife to cut from side

3) waini - 6 to 7 months growth

copra-producing coconut

use of liquid - usually thrown away, children drink occasionally

use of meat - eaten a) cut in wedges-with fish or by itself

b) grated and squeezed for coconut milk

c) use gratings in cooking, rice balls, mokan

4) iu - 8 to 8 1/2 months growth

spongy food inside sprouted coconut

use of iu a) eaten raw

b) cut up and boiled with sugar or jekeru

c) cut up and boiled with flour, sugar or jekeru

d) raw iu cut up and sweetened with sugar or jekeru

e) iuwumum - spongy meat of sprouted coconut baked in its shell

f) iutir - baked spongy meat

Food from coconut. sap

jekeru - sap from coconut blossom

uses - a) drinking

b) used as a sweetener in place of sugar, i.e., donuts, bread

jakamai - boiled jekeru into a syrup

uses - a) used mixed with cold or hot water as a drink

b) used for pancake syrup

c) used as a sweetener

amedama - jakamai syrup mixed with grated coconut rolled in a ball - coconut candy

coconut milk - produced from waini

method of extracting grated coconut from coconut meat is called roanke.

Then coconut milk is squeezed out of these coconut gratings.

uses - rice - Coconut milk squeezed into water at start of cooking.

Amount - coconut milk squeezed from one or two grated coconuts per 500 g of rice.

mokan - cooked pandanus meat that has been removed from the key (kiloc)

a) coconut milk added to mokanas as gravy

gravy - with clams, fish, breadfruit, pumpkin, used with all foods available.

3. Pandanus

The Pandanus fruit resembles a huge pineapple at superficial external glance. However, a closer inspection shows it to be made of large, individually extractable kernels surrounding a central inedible core, much like corn does on its cob. A pandanus fruit can weigh up to thirty pounds and consist of up to forty kernels or keys. These keys themselves are stringently fibrous in nature (indeed, a spent and dried key makes an excellent paintbrush), the inner portion of which contains the flavorful though somewhat stringy pulp which when raw has the consistency of a carrot and likewise can be mashed upon being cooked. The bulk of the pandanus fruit and a considerable portion of its weight is attributed to the upper inedible partially external portion or the keys. This external portion, which is particularly fibrous, is capped by a tough and nobby rind.

Pandanus is traditionally a very important staple for the Marshall Islanders, especially among the northern atolls where due to lack of sufficient rainfall depend less on Breadfruit, taro, bananas and papayas than do those Islanders living in the southern Marshalls. All over the islands it is eaten when ripe uncooked and in sufficient quantity to be considered a staple. Because of its availability throughout the interior or most islands and because it grows on even the distant unpopulated islands on all atolls, it is often used to ward off hunger during copra harvesting, brushing, fishing and inter-atoll travel. It is considered to offer relief from "morning sickness" and is sought by pregnant women who often eat tremendous quantities of it. Said to be good for sea-sickness it is piled onto vessels of all types and destinations and eaten by nearly everyone aboard during the entire length of the trip. The fact that it can be knocked about a great deal without danger of spoilage (due to its particularly tenacious rind) makes it especially suitable for inter-atoll export where it brings a good price in the district center and on Ebeye.

There are many different varieties of pandanus, some of which are always eaten raw. Others are normally boiled, steamed or baked in a ground oven before eating or processing because they are more starchy, very difficult to chew in their raw state and much more tasty and in particular sweeter after being cooked. These later are the varieties used in the preparation of mokon--the mashed pulp once it has been separated by mechanical means from the fibrous core using an apparatus called the bakan--in the process called kilok. Cooking allows pandanus to be eaten even in its unripe stages though generally speaking the more ripe the fruit the more mokon is produced in the kilok process. The varieties of pandanus are seemingly endless. Each variety has a characteristic shape, consistency, and flavor.

Jankwon is prepared from mokon by baking it to further reduce its water content and then by spreading it out usually on leaves to dry in the sun. The final product is then traditionally wrapped in pandanus leaves and tied with sennit. Though jankwon production is nearly a lost art over much of the Marshalls, it is still continued among the northern atolls, including Rongelap and Utirik where it is apparently a more firmly rooted tradition.

Pandanus - bob

fresh - eat when ripe or uncooked

eroum - boiled pandanus

bake - bake keys in ground

peru - Pandanus pulp and juice mixed with grated coconut and coconut oil and optionally with arrowroot starch, wrapped in breadfruit leaves and boiled or baked.

mokan - The pudding from a cooked pandanus key. The food is removed from the key by a process known as kilok. The cooked pulp is then mixed with other foods or eaten as is.

Examples: a) often mixed with grated coconut
b) mixed with coconut milk
c) served with fish
d) by itself as a dessert

jankwin - Cooked pandanus, extract from keys keys--mokkay, dry in sun, wrap in pandanus leaves and tie with sennit twine.

unripened pandanus - mashed with sugar or jekeru and water.

4. Arrowroot - mokmok

The arrowroot is dug up from the oceanside of the island, placed in a burlap bag, and washed until white. Each separate piece is then grated with a rock. The arrowroot is placed in a wanliklik made of sennit (from fibers of coconut husk) used for straining arrowroot starch. It is then rinsed with two buckets of saltwater. The arrowroot powder is then saved from the canvas or wanliklik, wrapped in a cloth and tied in a tree to dry. The powder is then removed from the cloth (bag), dried in the sun and then stored for future use.

ways of cooking - a) boiling with waini
b) Beru Pandanus and mokmok

5. Taro - iaraj

Stem and leaves are cut off and the remaining root and sugar (optional) added to boiling water. Cook one hour.

The root is also baked.

6. Fruit - kwale

banana - binana

when consumed and cooking method

- a) eaten when ripe
- b) baked, when not ripe
- c) fried
- d) boiled in skin
- e) mashed and mixed with coconut milk and coconut syrup, when ripe

papaya - keinabbu

when consumed and cooking method

- a) raw
- b) boiled and added to meat gravy
- c) boiled

pumpkin - baanke

when consumed and cooking method

- a) boiled
- b) cooked in gravy
- c) with coconut milk

sweet potato

when consumed and cooking method

- a) baked

7. Meat - kanniok

When eaten

chicken - haa

eaten: meat, liver, kidney, heart

special occasions--birthday, Christmas, Easter, parties

methods: cleaned, boiled

cleaned, boiled, fried

cleaned, fried

baked (rarely)

gravy - flour, shoyu, pumpkin, ma, keinappu bop

soup rice, same fruits as above

made leftover chicken

fish - ek

eaten: most meat on head, eyes, suck on bones

whenever the man in house goes fishing depending on productive nature of man

methods: not cleaned - cooked in skin on coals

fried with salt

cleaned, wrapped in coconut leaves - boiled

baked (rarely)

gravy - flour and fruits

soup - rice, fruits

cleaned, salted, dried in sun

fresh or sashmi

salted - 2 days in sun - meat good for 3 or 4 days

fry with coconut milk - stays good for months (preserves)

Note: one can eat fish for three days if it is cooked everyday

When eaten

-pik

eaten: meat, fat, heart, kidney, brain, suck on bones
methods: fried
 salted
 gravy - flour, shoyu
 baked (rarely)
 boiled - 20 minutes, add seasonings such as
 onions, garlic, vinegar, shoyu, salt
 if available

turtle - won

eaten: meat
methods: baked - most common method of cooking
 fried - when there is grease

the whole island eats when a
turtle is caught-no special
time

wild birds

eaten: meat, suck on bones
methods: cook on coals
 fry if grease available
 ground oven baking

mostly when overnight on other
island, enroute to other islands,
or special food gathering, trip
made

clams - kapwor - killer clams

methods: boil
 fry
 eat with el - coconut milk

whenever diving for them mostly
in conjunction with fishing

lobsters - war

eaten: tail and legs
methods: cook on coals
 boil

on fishing trips, when full moon
is out and man goes to oceanside
to get it.

coconut crab - barulep

eaten: tail, claws
methods: cook on coals

on fishing trips, overnights

wild bird eggs

method: boil

Easter time and when special food
gathering trips may have been made

chicken eggs

methods: boil
 fry
 used in other cooking
 ground oven baking

not eaten much, reserved for
production of chickens; eggs,
generally thought to be for sick
and pregnant people

turtle eggs

methods: boil

eaten when found - usually no
special trip is made to get them

8. Rice

Rice is cooked with coconut milk (el) which has been squeezed from coconut gratings. These gratings come from the copra producing coconut (amounts-one or two coconuts used per 500 grams of rice).

rice jokkwop - soft rice soup--water, rice flour, sugar, coconut milk

rice balls - cooked rice rolled in balls with grated coconut on outside used on special occasions, size of tennis ball.

9. Flour

bread - yeast

sugar or jekeru - coconut sap

flour

water

shortening

Doughnuts - yeast or baking soda

sugar or jekeru - coconut sap

flour

shortening

water

Cakes - flour

baking soda

sugar

water

egg (occasional)

milk

gravy - flour

water

sugar

additional food: pig, chicken fish, pumpkin, papaya, iu)

optional: shoyu

spices

pancakes - flour - 7 cups

shortening - two tablespoons

baking soda

milk - 13 oz. can

water

sugar - 1 cup

eggs - USDA 6 oz. (1 package)

Appendix C
Other Islands Used for Food Gathering

RONGELAP

No. of Times a Year Frequent	Name of Island	Foods gathered and Copra
4	Eniutok	pandanus, breadfruit, coconut crab, iu, fish, turtle and copra *people are apt to stay over while they make copra
2-4 days	Edbot	coconut crab, pandanus, iu, fish, lobster, turtle, coconuts, copra
24 days	Luwataki	pandanus, coconuts, fish, iu, turtle, coconut crab, copra
12 days	Likaman	coconut, iu, pandanus, turtle, coconut crab, copra *people stay over 2 weeks a year
12 days	Arbar	coconut crab, fish, pandanus, iu, turtle, coconuts
12 days	Keruke	fish, iu, coconut crab, arrowroot, turtle, pandanus breadfruit, clam, copra
6 days	Burok	coconut crab, pandanus, breadfruit, fish, iu, turtle, coconuts, copra (but not presently making it)
6 days	Kapelle	coconut crab, pandanus, breadfruit, fish, iu, turtle, coconuts, copra (but not presently making it)
6 days	Naen	fish (reef, lagoon), turtle, eggs, coconut crab, coconuts, copra (but not presently making it)
6 days	Ailañinai	Birds, bird eggs, coconut, coconut crabs, clams, turtle
6 days	Rongerik	birds, birds eggs, coconut, pandanus, turtle, clams
6 days	Malu	no information
4 days	Jokrak	fish, iu, turtle, coconut crab (don't normally eat), birds, eggs
4 days	Einablar	no information

Note: Now they have five outrigger canoes plus their community boat which they had before (often times not working). They are more mobile now and have more money to use the community boat so these figures are sure to change.

UTERIK

Awan - pigs, iu, breadfruit, pandanus
occasionally drinking coconuts, fish

Bekrak - iu, fish, pandanus, breadfruit, coconuts

Taka - birds, turtles, fish

Bikar - turtles

Nalap - fish, pandanus, coconut

Nate - fish, pandanus

Ellikiki - fish, pandanus, breadfruit, coconuts, coconut trees for planting

Biki - fish, pandanus, breadfruit, coconuts, coconut trees for planting

AILUK

People living on

Ajikik - 2

Ailuk - 250

Enejelar - 35

Enejabrok - 12

Kaben - 8

Bikan - 8

Baojen - 2

Aliej - 2

Akilwe

They go to all of the islands in their atoll to gather food.

Rarely visited: Jaeo, Binajrak, Bikrak, Enen Arno, Bokekan

Fishing only: Marme, Jebamit, Jirrankan, Bakanneaken, Alirok, Eense

<u>Island</u>	<u>Food Gathered</u>
Kaben	breadfruit, fish pandanus
Enejabruk	coconuts, pigs
Enejelar	coconut crabs
Bikon	arrowroot
Ajilep	
Aliej	
Akulwe*	

WOTHO

Bigkin - birds }
Anibling - birds } especially during Christmas and other special occasions

Kapen - breadfruit, pandanus

Medron - breadfruit, pandanus

Eneobinek - breadfruit, pandanus

all islands - coconuts, coconut crab, turtle, lobster

Appendix D
Data on Edible Portions of Marshallese Foods

COCONUTS - DRINKING

Rongelap

Volume (cc)	Meat (g)	Volume (cc)	Meat (g)	Volume (cc)	Meat (g)
250	100	260	115	480	280
260	62	300	120	230	90
500	110	550	240	240	130
350	152	500	160	370	100
350	80	350	124	580	220
300	46	350	80	260	144
500	130	600	130	260	150
250	75	350	46	350	125
230	80	300	130		
			Average	358	124
			Standard deviation	±116	± 56

Uterik

Volume (cc)	Meat (g)	Volume (cc)	Meat (g)
340	100	350	115
240	80	220	60
370	125	300	70
260	110	270	140
260	115	270	130
350	130	220	70
300	110	290	125
200	60	260	72
260	115	260	80
260	125	250	100
270	140	260	115
240	125	270	150
250	110	300	150
250	125	260	140
250	130	250	100
260	110	290	150
290	135	350	145
250	110	440	150
240	100	270	62
300	150	260	126
350	130	350	110
440	140	280	125
280	125		
250	105		
290	130		
		Average	115
		Standard deviation	± 26

COCONUTS - DRINKING

Ailuk

<u>Volume (cc)</u>	<u>Meat (g)</u>	<u>Volume (cc)</u>	<u>Meat (g)</u>
430	110	430	120
380	35	620	165
450	170	450	170
280	110	240	50
440	140	330	165
180	45	370	110
180	50	450	130
180	60		
180	55		
240	70		
240	75		
240	65		
240	60		
240	58		
240	45		
240	60		

Wotho

Average	316	92
Standard deviation	<u>±120</u>	<u>±46</u>

<u>Volume (cc)</u>	<u>Meat (g)</u>
330	95
310	85
340	100
330	59

\bar{X}	238	85	Average
S	<u>±13</u>	<u>±18</u>	Standard deviation

Coconut Data (Waini or Grating Type)

No.	Weight coconut (g)	Weight of coconut meat (g)	No.	Weight of coconut (g)	Weight of coconut meat (g)
1	340	227	29	494	343
2	397	255	30	416	277
3	300	205	31	340	236
4	360	253	32	465	282
5	446	267	33	490	350
6	500	312	34	476	280
7	490	288	35	433	259
8	280	200	36	346	237
9	400	250	37	490	306
10	420	262	38	510	319
11	460	270	39	496	282
12	440	293	40	355	237
13	400	267	41	418	271
14	480	300	42	455	292
15	360	225	43	515	303
16	320	229	44	316	226
17	380	238	45	296	206
18	410	263	46	314	209
19	354	230	47	356	244
20	395	271	48	294	216
21	375	257	49	456	275
22	330	224	50	399	256
23	440	268	51	482	313
24	472	311	52	509	299
25	426	284	53	365	235
26	386	280	54	492	319
27	349	253	55	515	334
28	420	247	56	338	241
Average				410	265
Standard deviation				± 68	± 36

PANDANUS

1.	Pandanus number	Weight (g) before*	Weight (g) after*	Weight (g) of food eaten
	1	144	93	51
	2	165.5	98.5	67
	3	148.5	103.5	45
	4	204.5	140	64.5
	5	139.5	83	56.5
	6	151	107.5	43.5
	7	137.5	90	47.5
	8	139.5	88	51.5
	9	154	107	47
	10	157	108.5	48.5
	11	161	109.5	51.5
	12	177	127	50
	13	133.5	87	46.5
	14	289(double)	188	101
	15	148	104	44
	16	155.5	105.5	50
	17	164	117.5	46.5
	18	189.5	131	58.5
	19	152	109.5	42.5
	20	131.5	89.5	42
	21	160.5	113.5	47
	22	171.5	123	48.5
	23	153.5	105.5	48
	24	142	102.5	39.5
	25	151	105.5	45.5
	26	156.5	116.5	40
	27	151.5	115.5	36
	28	127.5	91.5	36
	29	114.5	83.5	31
	30	134.5	82	52.5
	31	178	132	46
	32	186	139.5	46.5
	33	149	131	18
	34	168.5	122.5	46
	35	106	69	37

*weight before + after process known as kiloc method of extracting pudding from cooked pandanus

Average	156	106	46
Standard deviation	<u>+20</u>	<u>+17</u>	<u>+9</u>

PANDANUS

2.	Pandanus number	Weight before (g)	Weight after (g)	Net consumed (g)
	1	171	99	72
	2	173	114	59
	3	175	116	59
	4	182	123	59
	5	164	101	63
	6	143	81	62
	Average	168	106	62
	Standard deviation	<u>+14</u>	<u>+15</u>	<u>+5</u>
3.	Pandanus number	Weight before (g)	Weight after (g)	Net consumed (g)
	1	98	63	30
	2	94	66	28
	3	74	51	23
	4	90	64	26
	5	85	56	29
	6	84	52	32
	7	81	51	30
	8	84	55	29
	9	89	69	20
	10	78	52	26
	11	88	59	29
	12	91	63	28
	13	81	55	26
	Average	86	58	37
	Standard deviation	<u>+7</u>	<u>+6</u>	<u>+3</u>

BREADFRUIT DATA

Type	Total wt. (g)	Center (inedible) (g)	Edible wt. (g)
Batakatak	1193 964 308 820 1040 440 1856	63 33 14 30 23 11 51	1130 931 294 790 1017 429 1805
Average	903	32	913
Standard deviation	<u>±</u> 51	<u>±</u> 19	<u>±</u> 497
seeds			
Mejwan (with seeds)	520 490 380 476 505 396 350 412	23 18 14 19 18 12 15 21	387 110 276 96 264 102 365 92 365 122 289 95 247 88 290 101
Average	441	18	310 41
Standard deviation	<u>±</u> 64	<u>±</u> 4	<u>±</u> 56 <u>±</u> 11

Appendix E
Types of Fish and Methods of Fishing

1. NET FISHING - LONG NET, THROWN NET

<u>Marshallese Name</u>	<u>Scientific Name</u>	<u>Island</u>	<u>Method</u>
Ik kadre	A fish <i>Chelon vaigiensis</i>	Rongelap - long net	
Utot or dibab or wut wot	butterfly fish <i>Chaetodon anriga</i>	Uterik - long net	
Pajrok	chub or rudder fish <i>Kyphosus vaigiensis</i>	Rongelap, Wotho, Ailuk	
Balle	starry flounder <i>Platichthys stellus</i>	Ailuk - long net	
Jome	goatfish <i>Mulloidichthys auriflava</i>	Rongelap, Uterik - thrown net	
Jo	goatfish <i>Mulloidichthys samoensis</i>	Rongelap - long net Rongelap - thrown net Wotho - not specified Ailuk -	
Momo	grouper <i>Epinephelus hexagonatus</i>	Rongelap, Ailuk - long net	
Tinar	small grouper	Ailuk -	
Kalemeej	blue spotted grouper <i>Cephalopholis argus</i>	Ailuk -	
Kuro	grouper <i>Epinephelus fuscoguttatus</i>	Ailuk -	
Ettou	mackerel <i>Trachurops crumeptalmus</i>	Rongelap - thrown net, long net	
Iool	mullet <i>Crenmugil crenilabis</i>	Rongelap, Wotho - long net	
Akor	mullet <i>Chelon vaigiensis</i>	Uterik - long and thrown net	
Tak	needle fish <i>Belone platyura, Raphiobelone robusta</i>	Rongelap, Ailuk - long net	
Mao or Mera	parrot fish <i>Scarus jonesi/sordidus</i>	Wotho, Ailuk	

Lala or Lolo	parrot fish <i>Callyodon pulchellus</i>	Ailuk, Rongelap
Ik mouj	white parrot <i>Scarus harid</i>	Ailuk Wotho Uterik - long net
Ellek or Mole	rabbit fish <i>Siganus rastratus</i> or <i>poellus</i>	Rongelap - long and thrown net Uterik - long net Wotho Ailuk
Ek-Airik	rainbow runner <i>Elagatis bipinnulatus</i>	Uterik - long net
Kabro	rock cod <i>Anyperodon leucogrammicus</i>	Ailuk
Badet	Sergeant Major <i>Abudefduf stemfasciatus</i>	Wotho
---	moomoa <i>Abudefduf abdominals</i>	Wotho
Kwarkwar	Sardines <i>Sardinella</i> sp.	Rongelap - long net
Kupkup	skip jack (immature form) <i>Caranx lessonii</i> needle fish	Ailuk
Jetaar	<i>Belone platyura</i> , <i>Raphiobelene robusta</i> snapper <i>Lutjanus kasmira</i> <i>forskål</i>	Rongelap - long net Ailuk
Kur	spuirrel fish <i>Holocentrus binotatus</i> / <i>scythrap</i>	Ailuk
Mon	squirrel fish <i>Myripristis berndti</i>	Rongelap Uterik - long net Ailuk
Mone or eanrok	sturgeon fish <i>Naso unicornis</i>	Ailuk

Kupan	banded sturgeon fish <i>Acanthurus triostegus/linnaeus</i>	Rongelap - long and thrown net Uterik - long net Wotho -
Tiepdo	black sturgeon fish <i>Acanthurus nigricans</i>	Ailuk
Bub	black trigger fish <i>Melichthys ringens</i>	Ailuk, Rongelap
Ael	unicorn fish <i>Hepatus divaceus/scheider <u>Bloch</u></i>	Ailuk
---	orange spot tang <i>Acanthurus olivaceus</i>	Ailuk
Batakla	unicorn fish <i>Naso brevirostris</i>	Ailuk
Kibu	---	Uterik - long and thrown net Ailuk
Jorot	---	Uterik - thrown net
Akuba	---	Ailuk
Debijdrek	---	Ailuk
Ebil	---	Ailuk

2. FISHING LINE*

<u>Marshallese name</u>	<u>Scientific name</u>	<u>Island</u>
Niitwa or Jure	barracuda <i>Sphyraena forsteri</i>	Ailuk, Wotho, Rongelap
Lejabwil	bonito <i>Katsuwonus pelamis</i>	Ailuk, Rongelap
Koko	dolphin <i>Coryphaena hippurus</i>	Ailuk
Al	kingfish	Ailuk, Rongelap
Ikaidrik	rainbow runner	Ailuk, Rongelap
Jilo	dogtoothed tuna <i>Gymnosarda nuda</i>	Ailuk, Rongelap
Bwebwe	tuna <i>Neothunus macropterus</i>	Ailuk, Rongelap

*method used at oceanside (off the reef)

3. FISHING LINE *

<u>Marshallese name</u>	<u>Scientific name</u>	<u>Island</u>
	caught in deep water by lagoon or ocean	
Kuro	grouper <i>Epinephelus fuscoguttatus</i>	Ailuk, Rongelap, Uterik, Wotho
Lejebjeb	rock grouper or rockhind <i>Epinephelus adscensionis</i> <i>Epinephelus albofasciatus</i>	Ailuk, Rongelap (bottom fishing), Uterik, Wotho
Perak	scavanger <i>Lethrinus kolopterus</i>	Ailuk, Rongelap, Uterik
Dijin	scavanger <i>Lethrinus variegatus</i>	Ailuk, Rongelap, Wotho
Jato or Ikonbón or Jaap	red snapper <i>Lutjanus gibbus</i>	Ailuk, Wotho, Rongelap (bottom fishing)
Jera	squirrel fish <i>Holocentrus</i> sp./ <i>Myripristis</i> sp.	Ailuk, Uterik
Ewae or Loom	streaker <i>Aprion virescens</i>	Ailuk, Uterik, Rongelap
Lane or Ikbwij	skip jack <i>Caranx lessoni</i> /crevally	Uterik, Rongelap, Ailuk
Bwilak	unicorn sturgeon <i>Naso lituratus</i>	Ailuk
Weo	---	Wotho, Uterik, Ailuk, Rongelap

*used in deep water (lagoon or ocean)

3. FISHING LINE *

<u>Marshallese name</u>	<u>Scientific name</u>	<u>Island</u>
At-kadu	A fish <i>Moi polydactylus</i>	Uterik
Kanbok	bass <i>Variola louti</i>	Rongelap
Kie	big eye or burgy <i>Monotaxis grandoculis</i>	Rongelap, Uterik
Dibab	butterfly fish <i>Chaetodon ocellatus</i>	Uterik
Pajrok	chub ro rudderfish <i>Kyphosis vaigiensis</i>	Uterik, Rongelap
Jojo	flying fish <i>Exocoetidae</i> sp.	Rongelpa, Uterik, Ailuk
Jo	goatfish <i>Mulloidichthys samoensis</i>	Uterik
Jome	goatfish <i>Mulloidichthys samoensis</i>	Uterik
Momo	grouper <i>Epinephelus hexagonatus</i>	Rongelap, Uterik, Wotho
Pako	ground shark <i>Carcharhinus melanopterus</i>	Uterik, Rongelap
Lappo	hogfish <i>Chelinus undulatus</i>	Rongelap, Uterik
Iool	mullet <i>Crenmugil crenilabis</i>	Uterik
Ikunit	pilot fish <i>Hauirates ductor</i>	Uterik

3. FISHING LINE *

Imim	reef triggerfish <i>Balistopus retangulus/oculeatus</i>	Uterik, Rongelap
Mön or Arón	squirrel fish <i>Myristis berndti</i>	Rongelap - trolling
Kupkup	skip jack (immature form) <i>Caranx lessonii</i>	Uterik
Lojkan	shell fish	Rongelap
Jelaar	snapper <i>Lutjanus kasmira/forskal</i>	Uterik, Rongelap
Ban	snapper	Rongelap, Wotho
Kejwar	---	Rongelap
Lele	triggerfish, <i>Rhinecanthus aculeatus</i>	Wotho, Rongelap - bottom fishing
Jebos	---	Uterik
Kibu	---	Uterik
Melij	---	Rongelap
Januron	---	Wotho
Boklim	---	Wotho, Uterik, Rongelap - bottom fishing

*used in deep water (lagoon or ocean)

4. FISHING LINE*

<u>Marshallese name</u>	<u>Scientific name</u>	<u>Island</u>
Pajrok	chub ro rudderfish <i>Kyphosus vaigiensis</i>	Ailuk
Balle	starry flounder <i>Platichthys stellatus</i>	Ailuk
Jo	goatfish <i>Mullaooidichthys samoensis</i>	Ailuk
Tinar	small grouper <i>Lutjanus kasmira forksal</i>	Rongelap
Momo	grouper <i>Epinephelus hexagonatus</i>	Ailuk
Kuro	grouper <i>Playichthys stellus</i>	Ailuk
Tak	needlefish <i>Belone platyura, Raphiobelone robusta</i>	Ailuk, Rongelap
KupKup	skip jack (immature form) <i>Caranx lessonini</i>	Ailuk
Kur	squirrel fish <i>Holocentrus binotatus/scythrops</i>	Ailuk
Monor (Aron)	squirrel fish <i>Myristis berndti</i>	Ailuk, Rongelap
Kibu	---	Ailuk
Akuba	---	Ailuk
Ebil	---	Ailuk

*pole fishing in shallow water

5. SPEARING FISH

<u>Marshallese name</u>	<u>Scientific name</u>	<u>Islands</u>
Dep or Eddeup	A fish	Uterik
Kie	big eye or burgy <i>Monotaxis grandoculis</i>	Rongelap, Uterik
Utot or Dibab or Wutwot	butterfly fish <i>Chaetodon onriga</i>	Uterik
Kanbōk	bass <i>Variola louti</i>	Rongelap
Jawe	giant sea bass <i>Promicrops lancelatus/truncatus</i> <i>Plectropomus truncatus</i>	Rongelap, Uterik
Pajrok	chub or rudder fish <i>Kyphosus vaigiensis</i>	Rongelap, Uterik, Wotho
Monaknak	file fish <i>Amansis carolge</i>	Uterik
Bale	starry flounder <i>Platichthys stellatus</i>	Rongelap, Uterik
Jo	goatfish <i>Mulloidichthys samoensis</i>	Uterik, Wotho
Jome	goatfish <i>Mulloidichthys samoensis</i>	Uterik
Tinar	small grouper <i>Lutjanus kasmira/forskali</i>	Ailuk, Rongelap
Momo	grouper <i>Epinephelus hexagonatus</i>	Uterik, Wotho

continued

5. SPEARING FISH

Kuro	grouper <i>Epinephelus adscensionis</i>	Ailuk, Rongelap, Wotho, Uterik
Kalemeej	blue spotted grouper <i>Cephalopholis argus</i>	Ailuk, Uterik
Lappo	hogfish <i>Cheilinus undulatus</i>	Rongelap, Uterik
Lala	parrotfish <i>Callyodon pulchellus</i>	Ailuk, Rongelap
Mao or Mera	parrotfish <i>Scarus jonesi/sordidus</i>	Rongelap, Wotho, Uterik, Ailuk
Ellek or Mole	rabbitfish <i>Siganus rostratus/puellus</i>	Ailuk, Rongelap, Uterik, Wotho
Moramor or mormor	rabbitfish <i>Siganus sp.</i>	Rongelap
Kabro	rock cod <i>Anyperodon leucogrammicus</i>	Ailu, Rongelap
Lojebjeb	rock hind <i>Epinephelus albofasciatus</i>	Uterik, Wotho, Rongelap
---	grouper <i>Epinephelus adscensionis</i>	Uterik
Perak	scavanger <i>Lethrinus kollapterus</i>	Uterik
Mon or Moned	squirrel fish <i>Myripristis berndti</i>	Uterik
Jera	squirrel fish <i>Holocentrus sp./Myripristis sp.</i>	Rongelap, Uterik

continued

5. SPEARING FISH

Badet	sergeant major Abudefduf	Wotho
Jetaar (Jetaad)	snapper <i>Lutjanus kasmire/forskal</i>	Ailuk, Rongelap
Bonej	snapper <i>Lutjanus vitta</i>	Uterik
Iool	mullet <i>Crenmugil crenilabis</i>	Wotho
Tiepdo	black surgeonfish <i>Acanthurus nigricans</i>	Ailuk
Kupan	banded surgeonfish <i>Acanthurus triostegus/linnaeus</i>	Wotho, Uterik
Mone eanrok	surgeonfish <i>Naso unicornis</i>	Rongelap, Uterik
Imim	reef triggerfish <i>Balistapus retangulas/aculeatus</i>	Rongelap, Uterik
Bub	black triggerfish <i>Melichthysringens</i>	Ailuk
Lele	triggerfish <i>Rhinecanthus aculeatus</i>	Rongelap
Baraklaj	unicorn fish <i>Naso brevirostris</i>	Ailuk
Ael	unicorn fish <i>Hepatus olivaceus/schneider <u>Bloch</u></i>	Rongelap, Ailuk, Wotho
---	orange spot tang <i>Acanthurus divaceus</i>	Ailuk

continued

5. SPEARING FISH

Bwilak	unicorn - surgeon <i>Naso lituratus</i>	Rongelap, Uterik
Ik mouj	white parrot <i>Scarus harid</i>	Ailuk, Rongelap, Uterik, Wotho
Jiborbor	---	Rongelap
Kibuj	---	Uterik
Jonuron	---	Wotho
Boklim	---	Wotho, Rongelap
Ieo	---	Uterik
Ikenae	---	Wotho
Pebijdreka	---	Ailuk
Karlas	---	Uterik

RONGELAP

Fish poisoning from

imim - reef fish, trigger fish
Balistapus retangulus/oculeatus

jaliia - a fish scavanger, *Lethrinus miniatus*

jowe - giant sea bass, *Promicrops lanceolatus/truncatus*
bass, *Plectropomus truncatus*

iool - mullet, *Crenmugil crenilabis*

WOTHO

Fish poisoning from

mao
ekmouj
iōl
ael
lele
ikenae

Appendix F
School Children's Feeding Program

1. The school children's feeding program requires that each child should receive:

Type A Menu

Breakfast

Fruit - 1/2 cup
or
Fruit juice - 1 cup
Bread - 1 slice
Milk - 1 cup
Meat - 1 ounce (optional)

Lunch

Meat - 2 ounces
Fruit and vegetables - 3/4 cup
Milk - 1 cup
Bread - 1 slice
Butter - 1/2 teaspoon (optional)

Substitutions:

For meat we can use any canned meat, fish, pork, chicken, shell fish, jokra, clams, turtle, eggs, and peanut butter.

Instead of bread we can use 1/2-3/4 cup of rice, taro, breadfruit, coconut meat, bananas.

Fruit and vegetables can be any of the canned fruits and vegetables, papaya, pumpkin, taro leaves, sweet potato, Chinese cabbage.

Note: Each school is allowed \$100/month for purchase of local food.

2. Lunch program as carried out at the different Atolls/islands.

- a. Number of school days a week - 5
- b. Number of school days a year - 210
- c. Items and quantities

I: Breakfast

<u>Basic</u>	<u>Substituted by</u>	<u>Amount</u>
1. Fruit or	Fruit cocktail, peaches apple sauce, pineapple	57 g
Fruit juice	orange, grape, apple	240 cc
2. Bread or	flour	30 g
Rice	macaroni, oatmeal or taro, breadfruit, coconut meat, bananas	115-200 g (cooked weight)
3. Milk (powdered)	---	230 g
4. Sugar	---	15-30 g
5. Meat (canned) (fresh) or Fish (canned) or Fish (fresh)	eggs (processed), peanut butter, spam, beef stew, chicken, pork mackerel, tuna or fish, turtle, shellfish	30 g

II. Lunch

<u>Basic</u>	<u>Substituted by</u>	<u>Amount</u>
a. Meat - canned <u>or</u> - fresh*	spam, beef stew, pork, chicken	
<u>or</u> Fish - canned <u>or</u> - fresh*	mackerel, tuna fish, shellfish, turtle <u>or</u> peanut butter	57 g
b. Fruit and vegetable	Fruit cocktail, peaches applesauce, pineapple <u>or</u> mixed vegetables, peas, tomatoes, corn, greenbeans	57-85 g
c. Milk	---	240 cc
d. Bread <u>or</u> Oatmeal <u>or</u> Rice	---	29 g 114-170 g 114-170 g (cooked weight)
e. butter	---	8 g

Appendix G

Typhoon Relief

Family Distribution Guides for Donated Commodities

COMMODITY	UNIT	PER PERSON/MONTH	Number of persons in family																	
			1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
BUTTER/MARGARINE	3# CN	1# (1 LB) 454 g	1	:	1	:	1	:	2	:	2	:	2	:	3	:	3	:	3	:
POULTRY CANNED	29 OZ.	1 CN (29 OZ) 830 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
BEEF CANNED	29 OZ.	1 CN (29 OZ) 830 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
EGG MIX	6 OZ.	1 PKG (6 OZ) 170 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
FLOUR A/P	10# PKG	5# (5 LBS) 2290 g	1	:	1	:	2	:	2	:	3	:	3	:	4	:	4	:	5	:
ORANGE JUICE	45 FL OZ	1 CAN (46 FL OZ) 1380 cc	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
PEAS CANNED	#303 CN	1 CAN (1 lb) 454 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
BEANS CANNED	#303 CN	1 CAN (1 lb) 454 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
MILK EVAPORATED	14.5 OZ CN	1 CAN (14.5 OZ) 435 cc	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
MILK INSTANT	4# PKG	1# (1 LB) 454 g	1	:	1	:	1	:	1	:	2	:	2	:	2	:	2	:	3	:
PEANUT BUTTER	2# CN	1# (1 LB) 454 g	1	:	1	:	2	:	2	:	3	:	3	:	4	:	4	:	5	:
MACARONI	1# PKG	1 PKG (1 LB) 454 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
SHORTENING	3# CN	1# (1 lb) 454 g	1	:	1	:	1	:	2	:	2	:	2	:	3	:	3	:	3	:
CORN SYRUP	16 FL OZ	1 BTL (16 FL OZ) 480 cc	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
RICE	2# PKG	20# (20 LBS) 9080 g	10	:	20	:	30	:	40	:	50	:	60	:	70	:	80	:	90	:
POTATOES DEHYDRATED	1# PKG	1 PKG (1 LB) 454 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:
CORN CANNED	24/#303 CN	1 CAN (1 lb) 454 g	1	:	2	:	3	:	4	:	5	:	6	:	7	:	8	:	9	:

Source: Trust Territory (Majuro)

Appendix H
Food Supply Ships - Trip Schedule
(as carried out during 1977-1978)

MONTH	SOUTHERN ATOLLS	WESTERN ATOLLS	EASTERN ATOLLS	CENTRAL ATOLLS	NORTHERN ATOLLS
OCT	1- FTS	1- FTS	-0-	2- FTS	1- FTS
NOV	1- FTS	-0-	2- FTS	1- FTS	1- FTS
DEC	2- FTS	1- FTS	-0-	-0-	1- FTS
JAN	-0-	1- FTS	-0-	-0-	1- FTS
FEB	1- Spc	-0-	-0-	1- FTS	2- FTS
MAR	1- Spc, 1- FTS	1- FTS	-0-	1- FTS	-0-
APR	1- FTS	-0-	2- FTS	1- FTS	1- FTS
MAY	1- Spc-Kili, 1- FTS, 1- Spc-Kili	1- FTS	-0-	-0-	1- FTS
JUN	2- FTS	1- FTS	1- FTS	1- FTS	1- Spc
JUL	1- FTS, 1- Spc 1- Spc-Kili	1- FTS	1- FTS	1- UN Mission 1- B-Pick up	1- Spc 1- FTS
AUG	1- Spc, Kili, Jabor 1- Kili, 2- FTS	-0-	2- FTS	1- FTS	1- FTS
SEP	1- Spc, Jabor- Kili	1- FTS	1- FTS	2- FTS	1- FTS
OCT	<u>1- FTS</u>	<u>1- FTS</u>	<u>1- FTS</u>	<u>1- FTS</u>	<u>1- FTS, 1-Spc, Utirik,</u> <u>Rongelap</u>
	13 - FTS	9- Regular	10-Regular	11 -Regular	11- Regular
	7- Spc			2-Special	2 -Special

Appendix I

Private or Community Stores

Types of Food Available*

Rice	Corned beef	Tang	Shoyu
Flour	Tuna	Milk (powdered)	Shortening
Sugar	Sardines	Coffee	Iodized salt
Yeast	Mackerel	Tea	
Biscuit		Milk (canned)	
Peanut butter		Baby food	